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Emerging trends of knowledge management in organizations (2)

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SYSTEMATIC DOCUMENTATION FOR SPACE SYSTEMS WITH MARKUP LANGUAGES

Abstract

Text documentation is an integral part of internal and external information sharing for space missions. To produce this documentation, most spacecraft developers are currently using word processing software that follows a so-called WYSIWYG (“What You See Is What You Get”) approach. WYSIWYG software allows editing content and layout while displaying the final output in real-time to the user. On the other hand, typesetting systems like LaTeX represent documents using a plain-text markup language, which is then compiled into the final document. While WYSIWYG tools offer a smooth learning curve and several collaboration features, they often fail to scale well for larger projects, complex systems and automated pipelines. Authors, reviewers and editors often have to spend disproportionate time in formatting, alignment, integration of external data sources, representation of engineering data, and may face compatibility issues and vendor lock-in into proprietary systems. In this paper, we propose the use of alternative typesetting systems, such as reStructuredText, Markdown, MediaWiki markup, or LaTeX, as tools for the preparation of technical documentation that mitigate the previously mentioned issues. A markup-based typesetting system decouples the main text content from the layout and design of a document, allowing the document’s style to remain consistent and simplifying the authors’ tasks. Most such systems allow defining functions or “macros”, which are commands that can be reused across multiple documents. These macros can be programmed to serve some of the typical needs of space systems configuration control, such as advanced cross-referencing, bibliography tracking, document versioning and metadata, change tracking, and confidential information management. Tools like Mermaid or Graphviz allow defining technical diagrams in the text, significantly reducing maintenance effort. Additionally, we explore how the plain-text format of such documents can be exploited to cooperate with automated documentation generators and Model-Based Systems Engineering (MBSE) approaches. We further use case studies from internal and external space missions to demonstrate the advantages and results of such systems under their respective contexts. Finally, we present a fully functional LaTeX class, released as free software, which implements these features and can serve as a base template for engineering documents. We conclude that, while markup-based typesetting systems present a shift in philosophy from the typical WYSIWYG approaches, the available ecosystems and supporting collaboration tools can provide long-term advantages and opportunities for knowledge management in aerospace projects.